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SATURN'S MAGNETIC FIELD

A JPL magnetometer aboard Pioneer 11, the first spacecraft to fly past Saturn, detected that planet's magnetic field and determined its properties. The field, it was found, extends beyond a million kilometers from the planet and, unlike Earth, Jupiter, and Mercury, exhibits a high degree of symmetry about Saturn's axis of rotation. Thus, the equivalent magnetic dipole source is tilted only slightly with respect to the pole. The magnetic pole is less than one degree from the rotational axis, and the magnetic moment is 0.2 gauss r^3.

The strength of the field is 0.2 gauss atop the atmosphere at the equator, slightly less than the Earth's field at the corresponding location. It is slightly stronger at the north pole, 0.63 gauss, than at the south pole, 0.48 gauss, because the magnetic source is slightly north of the equator.

The planetary magnetic field was found to be deformed by the interplanetary wind streaming outward from the sun. The field is compressed near noon (observed when Pioneer was inbound) and stretched into a long magnetic tail near dawn (when Pioneer was outbound). Saturn's magnetic field forms a cavity from which the solar wind is excluded.

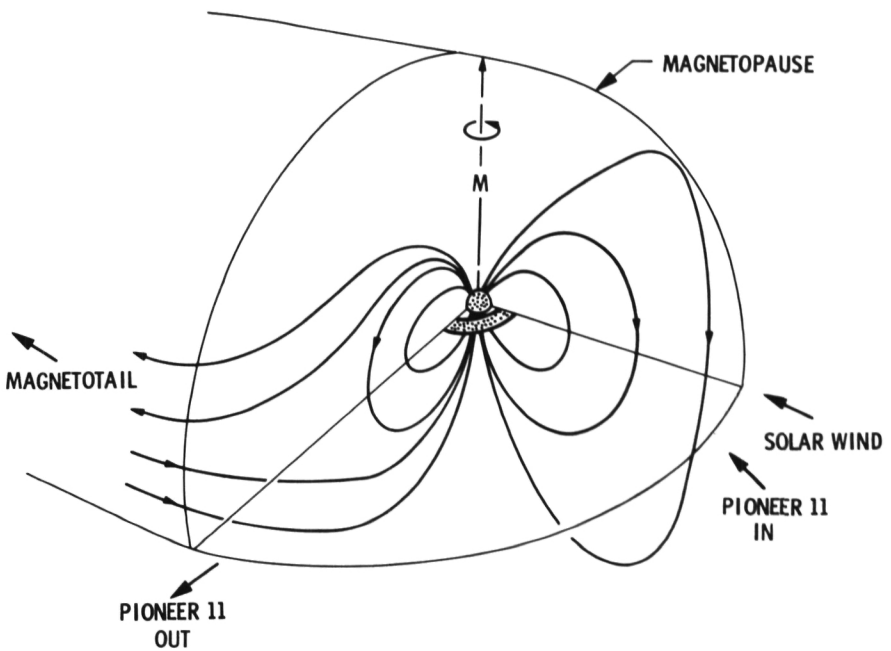

Diagram of the magnetic field of Saturn as observed by Pioneer 11. During the outbound portion of the trajectory, Pioneer observed that the magnetic field lines were being swept downstream to form a long tail. Saturn's magnetic dipole (capital M) is nearly aligned with the rotation axis of the planet. The magnetopause represents the boundary of the region from which the solar wind is excluded by the planetary field.